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MOVING EDUCATION AND TELECOMMUNICATIONS INFRASTRUCTURE FORWARD

Prepared for:
The Governor's Council on Innovation and Technology

GCIT Strategic Planning Committees
September 2005

GCIT STRATEGIC PLANNING COMMITTEES

Under the leadership of the Governor's Council on Innovation and Technology (GCIT), the GCIT Strategic Planning Committee was formed to address foundational issues that impact the future growth and sustainability of technology-based economic development.

For the purpose of this report, the Strategic Planning Committee established two Sub-Committees for fiscal year 2005 – Education and Telecommunications Infrastructure. The following missions guided key recommendations for improvements in Arizona's education system and statewide telecommunications infrastructure:

GCIT Strategic Planning Committee
Wendy Vittori, Chair
Motorola

Mission: Unlock Arizona's competitive potential by strengthening the essential foundation for innovation and technology through coordination and advancement of state and regional capabilities.

GCIT Education Sub-Committee
Barbara Clark, Chair
Motorola

Mission: Accelerate student learning for success in a dynamic technology-rich workforce and post-secondary education.

GCIT Telecommunications Infrastructure Sub-Committee
Chris Cummiskey, Chair
GITA

Mission: Improve Arizona's telecommunications infrastructure, with a primary focus in rural areas.

EDUCATION SUB-COMMITTEE

Under the leadership of the GCIT Strategic Planning Committee, the following business and community leaders are represented on the Education Sub-Committee:

Barbara Clark, Chair
Motorola

Mary Baldwin
Boeing

Dora Barrio
Rodell Foundation

Jeff Billings
AZ Department of Education

Marilyn Carlson
CRESMET

Susan Carlson
AZ Business and Education Coalition

Matt Diethelm
AZ State Board of Education

Gypsy Denzine
Northern Arizona University

Tammara Edgin
Microsoft

Milt Erickson
Governor's Workforce Policy Council

Greg Hickman
Center for the Future of Arizona

Becky Hill
Office of the Governor

Craig Johnson
Sierra Vista Chamber of Commerce

Steve Kiefer
Maricopa Community College District

Ted Kraver
eSATS Advocacy Coalition

Michael McVey
University of Arizona

Jim Middleton
Arizona State University

Andrew Morrill
AZ Education Association

Temako J. Roque
M.L.K. Jr. Elementary School

Sandra Watson
AZ Department of Commerce

Jim Zaharis
Greater Phoenix Leadership

TELECOM INFRASTRUCTURE SUB-COMMITTEE

Under the leadership of the GCIT Strategic Planning Committee, the following business and community leaders were represented on the FY 2005 Telecommunications Infrastructure Sub-Committee:

Chris Cummiskey, Chair
GITA

Art Ashton
Arizona Board of Regents

Sally Bender
County Supervisors Assoc.

Wayne Boline
Raytheon

Denny Brown
APS

Catherine Connolly
League of Cities & Towns

Mark Goldstein
International Research Center

Gil Jimenez
AZ Dept. of Commerce

Mike Keeling
Data Site Consortium

Richard King
Central Arizona College

Matt McClymonds
Yuma County

Richard McNeely
Arizona Telemedicine

Victor Mendez
AZ Dept. of Transportation

Cory Miller
AeA Arizona

Marcus Needham
The River Internet Access Co.

Bradley Ryan
Bank One

Andrea Schlanger
Connect Tech Intl.

Michael Sherman
SRP

Ben Standifer
Tohono O'odham Nation

Bill Stuart
Arizona K-12 Center

Galen Updike
GITA

Vaughn Wilhelm
Apache County

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EXECUTIVE SUMMARY

Moving Education and Telecommunications Infrastructure Forward requires Leadership, Investment, and Policy.

Arizona's communities are diverse. A community is no longer defined by its geographic boundaries. Technical advances are making it possible for people to live, work and learn from anywhere.

Wired or wireless, with the proliferation of the Internet, mobile phones, communication devices, and wireless networks we are rapidly moving from a world of simple voice communication and isolated desktop computing to an interconnected world of networked communities and anytime/anywhere connectedness where everyone and everything is connected. The Network will operate everywhere, connecting people and devices seamlessly. -Living in a Networked World-Computer Systems Policy Project

In Arizona, foundational improvements in education and telecommunications infrastructure, specifically in rural areas, are required to provide better access to the networked world. These elements are essential in attracting and retaining talent, as well as sustaining economic growth. Today, regional economies must offer more than basic infrastructure, transportation networks, low production costs, availability of land and other natural resources to be competitive. Quality education and advanced telecommunications infrastructure are fundamental to global business competitiveness.

It is no secret that a well-educated workforce attracts new companies and new investment. While Arizona has done well by importing skilled workers, our "home grown" workforce does not measure up. Arizona receives low marks for the rate of high school completion and the share of high school graduates continuing on to college. Eighth-grade proficiency test results are below average and vary widely across the State's regions. Arizona ranks low in per capita spending – bottom tier for K-12 education and 45th for higher education.

Education and Telecommunications Infrastructure investments are necessary to continue to improve Arizona's talent base and provide access to all who wish to participate in the global economy. The strategies and initiatives outlined in this report are designed to enhance human potential and business growth in Arizona with an emphasis on the following:

1) Prepare Arizona's future workforce through the P-20 continuum by creating a state of the art educational system that meets future demand; and
2) Provide access to education and employment statewide through improved telecommunications infrastructure.

The global marketplace of the 21st century demands a highly skilled workforce to allow companies to rapidly produce goods and services marked by innovation, knowledge and quality. Arizona's economic future depends on the quality of its education and workforce, as well as a "just-in-time" delivery mechanism, which is dependant on improved access to advanced telecommunications infrastructure. Ultimately, this combination provides Arizonans a solid foundation to secure better quality jobs.

The following mission serves as a guide to facilitate human, business and economic opportunity, where improved education and telecommunications infrastructure equal enhanced human potential and business growth:

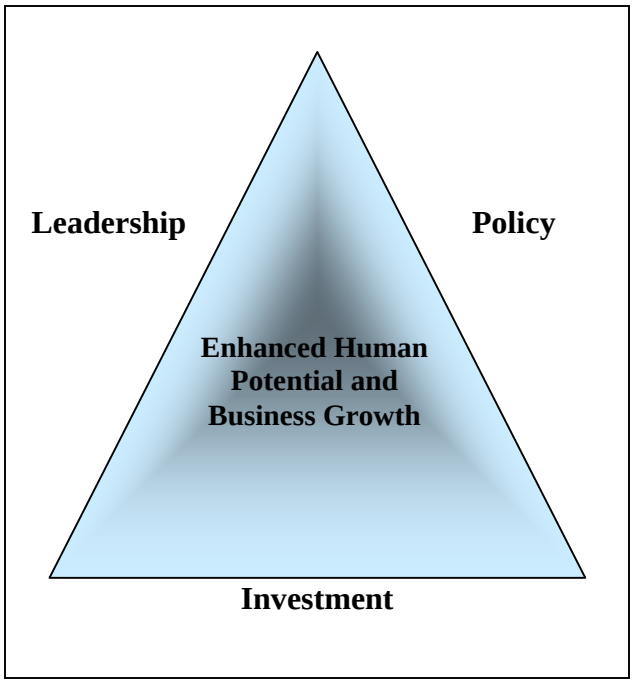
Unlock Arizona's competitive potential by strengthening the essential foundation for innovation and technology through coordination and advancement of state and regional capabilities.

To achieve this mission, three primary components are required:

1) **Leadership:** Provide leadership and vision by developing a world-class education system and improved telecommunications infrastructure to enhance human potential and business growth.

2) **Investment:** Assist in the development of human capital by providing local community capacity building, through education and access to advanced telecommunications infrastructure.

3) **Policy:** Develop and support policies that ensure access to quality education and telecommunications infrastructure, ensuring a well-trained, productive and flexible workforce that meets the needs of business to compete in a rapidly changing, global environment.



The following strategies can be accomplished through a commitment and understanding of the important role education and access to telecommunications infrastructure play in the state's economic success:

	Education	Telecommunications
Leadership	Quality educator preparation, including professional continuum and increased effective use of 21st century tools and strategies Emphasize the importance of Formative Assessments to improve student learning as an integral part of the complete learning environment	Establish a standing Telecommunications Infrastructure Advisory Group Establish a broadband authority Develop a statewide telecom strategic plan Convene a series of telecom roundtables statewide
Investment	Systematically deliver and upgrade technology solutions and provide professional support for educators	Expand the role of the Arizona Corporation Commission in broadband deployment, including additional funding to support telecom infrastructure Facilitate increased use of the federal E-rate subsidies Provide ongoing funding for Community Telecom Assessments
Policy	Promote the Value of Integrating Technology into Learning Focused preparation and renewal for educators Accelerate and reward increase ed technology skills. Improve opportunity for educator effectiveness Develop and deliver a common suite of technology tools for classroom use	Adopt an Arizona definition of 1Mbps for Broadband Expedite access to local, state, federal and tribal rights-of-way Monitor legislative actions to ensure that explicit or de facto barriers to municipal participation are eliminated

This plan provides a framework to further Arizona's economy. As outlined in the individual plans that follow, *Moving Education and Telecommunications Forward* provides the basis to enhance human potential and business growth, through quality education and access to telecommunications infrastructure statewide.

EDUCATION SUB-COMMITTEE

Much has been written lately regarding the impact of education policy and outcomes on pipeline issues in workforce development in Arizona. The basic picture that is painted is quite frankly, bleak. Arizona ranks low in nearly all indicators of academic success. As perhaps the most telling indicator, we currently have a 72 percent high school graduation rate in a system with a little more than a million students (Morrison Institute for Public Policy, 2005).

The Flinn Foundation (2005) in their wake-up call, *Meds & Eds: The Key to Arizona Leapfrogging Ahead in the 21st Century*, report that this 21st Century economy will be driven by innovation in the form of new knowledge and resulting products and patents. The capacity for entering into this innovation-driven economy requires three concurrent elements: 1) Expertise in the form of smart, talented people and strong research and development capacity, 2) Interaction in the form of strong networks and facilities and compact geography that bring these experts together, and 3) Diversity, in the sense that people from *different* knowledge fields and cultures must work *together* to solve complex problems of import to society.

Nationally, the economic equation has already changed. The number of jobs in manufacturing, skilled labor, and clerical and technician fields has dropped significantly (up to 65% reduction in force in some areas). Economic success for Arizona hinges on changing its economic base rapidly. To do this it must *build the internal capacity for developing workers* at a scale previously unheralded, *and* creating the technological infrastructure for complex, coordinated innovation.

In public education, we must develop a *system* that is *coordinated.* The long-term strategy is complex and expensive, however, Arizona has two critical advantages that can be brought to bear immediately to improve the knowledge and skills of students. The first, near completion, is a statewide information delivery system that will, when finished, connect all teachers in the State who have internet access to professional development opportunities, teaching and learning tools, assessment data, and to other stakeholders in education. The second is a high concentration of education experts in the State Universities and Community Colleges, the Department of Education, in Business and Industry and other stakeholders. In a renewed sense of urgency and cooperation, these agencies are currently working together to envision and deliver the required professional development for teachers to become proficient in content and content delivery, the use of technology for teaching and learning, and the use of data to drive instructional decision-making.

In summary, this report recommends the creation of a system of Standards-based formative assessment, and the creation of a system of teacher professional development utilizing technology, as the lynchpins that link the technological infrastructure nearing deployment to the development of innovation skills for Arizona's 21st Century economy.

New Reality: ***Digital Kids and Analog Adults, Implications to the K-12 Industry in Arizona***

In the last few years, the Nintendo Generation has come and gone from the hallways of Arizona's K-12 schools. A new breed of student has emerged. One that spends some 6.5 hours a day, digitally connected (Kaiser Family Foundation, March 2005). Called Generation Y, they are the children of the last phase of the baby boomers.

So prevalent is their digital connection, that it has evolved from what use to be an environment to what is now, an instinctual force - they are "Digital Kids". From wireless computers to international online gaming, to videophones, to musical iPods - they communicate, learn, entertain and live in a digital world.

Students and children now conduct hyper-communication, from multi-person online chats, blogging, and instant messaging using cell phones. They have more information accessible at their fingertips using advanced searching on Google and Yahoo, than their parents had throughout their lifetimes. And the kids use it, dynamically and somewhat chaotically.

Students and children regularly flow non-linearly through Graphical User Interfaces (GUI's), while "Analog Adults" struggle with the inherent random exploration of digital devices. Adults have been taught and expect the students to learn in a systematic and sequential order of things. Yet, technology and more importantly the wealth of information now available to these students, has created a significant divide between students and teachers. The divide is squarely drawn between the Digital World of Kids and the Analog World of Adults.

Nowhere is this divide creating more problems than in the K-12 education industry. As first presented by Apple Computers - we have digital "native" learners who prefer to receive information quickly and from multiple, multimedia sources, while the digital "immigrant" teacher prefers slow and controlled release from limited sources. Similarly, the digital native learner prefers random access to hyper-linked multimedia information, while the digital immigrant teacher prefers to provide information linearly, logically, and sequentially.

These kids are hyper-communicators, who can multi-task, and they embody the true meaning of differentiated learners. Our K-12 industry must accelerate our instruction and curricular delivery into the 21st century, professionally developing our teachers and demanding the expectation that they become digital to help guide the learning of our digital children. It will take four key components; Leadership, Access, Time and Attitude. But, the investment in our kids is worth it. If we're not up to the task, our most precious resource, our children, will be forced to compete as a second rate country in the digital world, in the not-to-distant future.

As a result of the Sub-Committee's comprehensive analysis, two priorities were identified. This was due to the immediacy for increasing teacher quality at all levels of training and professional development, as well as the need for a rapid design process to have data feedback loops to guide its continuous improvement. In addition, the economics of pursuing these priorities are immediately feasible within the appropriations of the State.

Therefore, by beginning with knowledge and data as the first principles of improvement, the GCIT Education Sub-Committee envisions technology in its proper place: a tool to enhance human capacity for immediate gain and the betterment of future generations.

However, the Sub-Committee recognizes that building the technological infrastructure does not insure that people will use it or use it effectively. Building innovative curriculum does not insure that people will implement it. Generating data does not mean that people will analyze it and use it to drive decision-making. These elements must be designed concurrently, *systematically*, to insure that goals of availability, use, and impact are adequately met.

Ultimately, workforce development in Arizona is contingent upon the creation of an educational system focused on innovation skills. Technology must serve as the backbone and delivery infrastructure for the development of these skills, and it must become a tool for thinking in diverse, trans-disciplinary, networked environments that birth innovation.

Therefore, the following recommended strategies are proposed as first steps in accomplishing the Sub-Committee's mission to *accelerate student learning for success in a dynamic technology-rich workforce and post-secondary education.*

1) Educator Preparation - Professional Continuum and the Increased Effective Use of 21st Century Tools and Strategies

The Governor's Council on Innovation and Technology must play a key role in promoting the use of technology and aid in communication and collaboration between business/industry and education. By establishing the appropriate mechanisms to support educators and their need for preparation and renewal, the state will reaffirm the important role education plays in the state's economic success.

Moreover, educational technology must be thought of as educators trained in digital curriculum and formative assessment, using new means and methods to achieve high student contact within individualized and small groups for increased academic achievement. The image of computers and networks is relegated to a necessary but supporting role. Specific strategies to prepare educators and increase the effective use of 21st century tools include:

Promote the Value of Integrating Technology into Learning:

- Develop online materials for each grade covering a range of reading levels and sets of skills that span traditional curriculum boundaries.
- Broaden curricular possibilities at each grade level, creating **Standards Plus.**
- Re-think the structure of schooling including the length of school day, learning environment groupings, and teaching methodologies.
- Recruit and retain trained personnel.
- Provide educators with release time to promote reflection and shared learning with colleagues.
- Encourage University training programs that increase technology expertise.
- Encourage shared learning communities for the purpose of ongoing reflection.
- Develop a statewide Educational Technology Advisory Board for K-12.

Focused Preparation and Renewal for Educators:
Accelerate and deliver a pre-professional and professional development curriculum that values the use of technology in the act of teaching, including:

- A common understanding of the use and integration of technology into the learning environment to enhance student learning.
- Develop educator content knowledge at all grade levels to ensure a standard awareness of technology and its integration into the curriculum.
- Prepare educators by creating awareness of and access to essential software connecting student curriculum and content knowledge.
- Demonstration of essential software and its value to educators.
- Specific training that helps demonstrate an understanding of how technology can further the goals of content through methodologies in the delivery of content, formative date, data usage, individualization of instruction, and assessment.
- Encourage and value an unflagging interest in children's learning in its many forms.
- Demonstrate the knowledge of student learning through the design and conduct of instruction.

Accelerate and Reward increased technology skills:
Operate within the expectation that instructional leaders who have taken advanced educational technology training:

- Educators must be able to disaggregating data.
- Educators must have a common suite of technology tools.
- Educators must be aware of adaptive technology advances to aid students who, through disabilities for example, require alternate delivery options.
- Educators must be able to use innovative technology to enhance delivery of any existing curriculum.
- Educators must know how to use appropriate tools such as communication and productivity tools, specific applications, general simulations, environments, and assessment tools
- Educators must be able to identify teaching tools required.
- Certificates for formative data analysis training will be developed through learning groups or online modules.
- Districts should compensate professional growth.

Systematically deliver and upgrade technology solutions and provide professional support for educators.

- Identify and utilize technology resources that are relevant to administrators and educators.
- Ensure that technology is regularly updated and includes tech support provisions.
- Establish a clearinghouse of technology resources that are coordinated with elements of state technology plan.
- Develop a statewide model to deliver digital curriculum to learning environments via a statewide broadband system.

- Establish a web portal system that provides support to every class, including broadband curriculum and formative assessment tools.
- Include qualified sources of digital curriculum to assist LEAs in making decisions on digital content.
- Develop an online repository of best practices focusing on the incorporation of educational technology in Arizona's learning environments.
- Provide access to information for all educators, on demand.
- Ensure that Educators have access to student data to properly evaluate each student and determine next steps for student learning.
- Distribute formative student data through a statewide network that encourages feedback, collaboration, and interaction.
- Expand the concept of regional training centers and provide additional support for the use of technology in the learning environment.
- Cross-train academic and technology education instructors in innovative technology delivery.
- Identify ways for educators to learn from "expert" educators.
- Identify technology experts and coaches within and between districts.

2) The Importance of Formative Assessments

Formative Assessment is defined as infrastructure that provides districts and schools with reliable, transparent, and timely data to drive targeted improvement, including educators that have the knowledge, skills and tools to continually monitor students' achievement and to intervene quickly when students are not progressing sufficiently. (National Association of State Boards of Education, 10/04 "Closing the Achievement Gap")

Using formative data to improve student learning is something educators do every day. When an educator grades tests or observes students at work, the educator uses that formative data to re-teach the concept. Formative assessment is defined as on-going, real-time feedback from students for educators to use to improve their students' standards-based learning in all subject areas and help educators refine instruction to increase student learning.

Schools and school districts can similarly respond to data to improve programs thanks to advances in technology. Getting information from data is part of the puzzle and using the information to inform wise decision-making is another piece. Eventually students will be able to use the feedback to improve and take responsibility for their own learning.

Specific strategies to effectively develop and use formative data include:

Broaden Educator Effectiveness in Student Learning

Formative data analysis, as part of a state-wide professional development training plan, is not considered a discrete or separated task but is integral to the whole learning

environment. The ultimate objective of training is to improve educator effectiveness in the ability to use formative data/information to improve instruction and student learning.

- Develop relevant and accessible professional development opportunities for Learning environment Educators and Administrators; checklist includes:
  - Customized
  - Frequently updated
  - Driven by research and data
  - Aligned to standards
  - Job-embedded
  - Adopted by the LEA and stakeholders
- Educate Educators on how to query data for new information about student learning.
- Improve Educator confidence by providing analytical tools that advance professional development skills and capabilities.

Develop and Deliver a Common Suite of Technology Tools

In order for formative data to inform and guide educator decisions and actions, we recommend that every educator in Arizona have a common suite of software tools.

- Establish an advisory group to determine statewide common suite of tools.
- Provide a suite of tools for continuous assessment and rapid turnaround time from assessment to instructional modification.
- Develop formative data assessment skills with Reading, Writing and Math, and then rapidly move to other curricular areas.
- Develop one to one support through broadband access statewide.
- Utilize web browsers, e-mail readers, chat tools, audiovisual programs, word processing, spreadsheets, presentation tools, and graphical organizers to facilitate communication and collaboration.
- Make software available through a web browser to provide easy access to LEA's and other stakeholders and minimize costs.
- Allow educators access to data for site-based analyses.

TELECOMMUNICATIONS INFRASTRUCTURE

Broadband telecom is essential to educational, economic, health, welfare, safety, and community development in Arizona. In the past three years, Arizona has seen improvement in its broadband landscape. The greater metropolitan areas have an increasing number of both basic (200 Kb) and advanced (45 Mb +) broadband options. The majority of rural communities now have access to basic broadband last-mile services such as cable modem, DSL, or wireless.

In the *Networked World*, it is not enough to have just basic broadband service, however, many rural communities do not have the infrastructure in place to support advanced broadband deployment. Many rural Arizona communities still lack consistent coverage of basic broadband services, as well as high capacity services.

Of the rural communities that have services, many still face middle and last-mile deficits, experiencing higher service costs, making it unaffordable to end users. Many of these rural communities also experience a lack of redundancy to and from their community in order to maintain connectivity in the event of network casualties. Because advanced broadband telecom services are either not consistently available, or not affordable, communities in need of economic development and revitalization lack the necessary infrastructure to grow and attract businesses.

Not only are the infrastructure and services not available for the businesses that drive these rural local economies, they are also unavailable to residents, educational facilities, critical services such as police and fire, health care institutions and government offices. As a result, access to advanced applications such as eLearning, telemedicine and e-Government is limited. For them the digital divide just gets wider.

The Telecommunications Infrastructure Sub-Committee (TISC), focused on establishing strategies to ensure rural communities are connected to the networked global economy, developed the following goals:

- Accelerate deployment of a statewide advanced telecommunications infrastructure that will insure availability of advanced telecommunications services and affordable, high quality, high speed Internet access throughout the State.
- Develop voice, video and data applications that ride over the infrastructure that will link the Arizona community and support education, economic and community development.
- Develop strategies to Bridge the Digital Divide

In order to better understand broadband, consensus on its definition is needed. The FCC defines broadband as an Internet connection at a speed of 200 kilobits per second (kbps)

in either direction. The defined speed is the subject of much debate, and projected to increase over time. Today, the definition should be at least 1Mbps.

In order to properly recommend strategies to improve assess, infrastructure development deficits must be understood. The following provides an analysis of the deficits as determined by significant research and Arizona's lack of broadband access in rural areas:

1. **Middle Mile:** There are two primary telecom services required to deploy broadband into a community – Last Mile and Middle Mile. The Last Mile is the Internet connection between the Internet service provider (ISP) and businesses, homes, schools, etc. The Middle Mile is the high capacity trunk lines and associated infrastructure that connect communities to the Internet backbone points-of-presence generally in Phoenix and Tucson, and, in some cases, Albuquerque or Los Angeles.

   Due to recent advancements in wireless, and other technologies, last mile deployment of broadband is becoming more cost-effective, even in rural and underserved areas of the state with distributed populations. As a result, a number of companies have expressed interest in providing last mile service in these areas. However, in order to deploy their networks, and charge reasonable rates, they must have access to sufficient and reasonably priced middle-mile connections.

   It is estimated that an investment of $80-$150M is required to address the middle-mile infrastructure deficiencies in Arizona. If a common middle mile infrastructure is not available at reasonable rates, communities, or last mile providers, must construct their own middle mile infrastructure. This ultimately increases the last mile costs, which in turn significantly increases the cost to the end user.

2. **Interoperability:** There is a lack of interoperability (interconnection) between and among public and private providers of broadband services.

3. **Redundancy:** An additional problem is the lack of redundancy (more than one path for telecommunications transport) to/from a community in order to maintain connectivity in the event of network casualties. Many of Arizona's rural communities are "fed" by a single route of fiber or microwave radio systems. Repeatedly, communities and even regions of the State have been "cut off" from the rest of the world due to damage inflicted on these single-point-of-failure routes. In the event of an emergency or disaster, most communities would have no backup system, unless cell/wireless phone companies had built their own parallel network into the community.

The TISC posted a Statewide ABC Network Request For Information (RFI) to better understand the requirements of telecom providers. The responses from the providers included a discussion of barriers, issues, cost, and solutions, based on "provider partnerships". Overall solutions involved coordination of provider-side capabilities and

service management with Arizona public-sector-owned resources to generate cost savings, increased efficiency, and improved performance. Specifically, the aggregation and coordination of both the provider-side and public sector consuming side is viewed as vital to Arizona's broadband future. This will ensure integration of all forms of communications traffic into a more cohesive and flexible network, resulting in higher performance, better availability, and potentially a lower unit cost for service.

Based on this analysis, the TISC identified the following broadband deployment barriers:

1. **Leadership, Planning and Coordination:** The RFI consistently illustrated the need to coordinate the various Broadband initiatives underway in Arizona. Responses showed that currently there is no coordinated statewide strategy.

2. **Lack of cooperation:** There is a lack of cooperation among the telecom providers and lack of public and private cooperation

3. **Funding:** Where rates cannot carry the load of deployment, Arizona needs to more effectively leverage grant dollars in those areas. In addition, there needs to be established additional funding mechanisms, such as an Arizona Broadband Universal Service Fund.

4. **Return on Investment:** Broadband deployment requires a balance between deployment costs and "affordable" monthly end user rates. The length of time for the provider's Return on Investment must be balanced within a reasonable and acceptable pricing structure.

5. **Access to Rights-of-Way:** Federal, tribal, state and local Rights of Way, including required multiple jurisdiction permitting, delayed application approvals, unequal and prohibitive fees, all act as severe impediments to Broadband deployment. There needs to be constant balancing between the necessities and value of Rights of Way and the necessities and value of Economic Development associated with Broadband deployment.

In addition to the RFI, the TISC initiated a comprehensive review of best practices in other States, as well as an assessment of current conditions in Arizona. Actively involved in this process, the Arizona Telecommunications and Information Council assisted the TISC in developing recommendations that support advanced telecom and broadband deployment in Arizona. The following recommendations have been prioritized in three main categories, which include Leadership, Investment and Policy Development:

1. Leadership

Establish a Telecommunications Infrastructure Advisory Group by elevating the TISC to a full committee under the Governor's Council on Innovation and Technology, led by GITA, to enable greater leadership, planning and coordination.

Consider establishing a Broadband Authority or Commission. Develop a detailed strategy and recommended structure, based on best practices, to establish an Authority or Commission. Also, recognizing existing financing mechanisms such as the Commerce and Economic Development Commission and the Greater Arizona Development Authority, evaluation should include the possibility of expanding an existing mandate to include broadband. Additionally, funding from sources such as the Arizona Universal Service Fund, tax incentives, bonding, tribal gambling, E-rate, and other Federal programs including homeland security should be considered.

The responsibilities of this new Authority or Commission may include the following: provide incentives and low cost, long term financing to encourage private sector development of redundant, middle-mile and last-mile telecom solutions in the state; issue bonds and notes; make loans and provide joint venture and partnership arrangements to broadband developers and broadband operators for financing or refinancing; enter into contracts for the lease or management of the infrastructure; and enter into joint venture and partnership arrangements with persons that will acquire, construct, develop, create, maintain, own, and operate the infrastructure. Owners of the network may be private, public or public/private partnerships. Any funding for public or public/private networks using state or federal funds must be open on an equal basis to all.

Provide support for the development of a Statewide Telecom Strategic Plan that will enable the vision, framework and strategies for the deployment of a statewide telecom infrastructure.

Convene a series of Telecom Roundtable discussions regionally and statewide, to facilitate awareness, collaboration and cooperation regarding the many statewide telecom infrastructure initiatives, including TOPAZ related initiatives, the Arizona Telemedicine Program, National Lambda Rail, the CANAMEX Corridor, etc. Based on these discussions, develop a database of current telecom plans and initiatives in Arizona that provide an ongoing view of status, goals, geographic boundaries, etc.

2. Investment

Encourage the Arizona Corporation Commission to modify the current Arizona Universal Service Fund; or establish an Arizona Broadband Universal Service Fund to support broadband deployment. A detailed strategic plan with recommendations will be developed and presented to the above proposed Telecommunications Infrastructure Advisory Group prior to implementation.

Provide state support to identify potential funding sources and grant writing assistance to help fund telecom infrastructure projects.

Implement a strategy to facilitate increased use of the federal E-rate subsidies in the state.

Provide ongoing funding for Community Telecommunications Assessments to identify community telecom assets, assess their needs, and develop and implement telecom infrastructure strategies and initiatives.

3. Policy Development

Adopt an Arizona definition of Broadband to be 1Mbps: Although the FCC defines broadband as an Internet connection at a speed of 200 kilobits per second (kbps), 200 K is already inadequate for applications such as telemedicine and e-Learning, which have ever increasing bandwidth requirements.

Encourage access to local, state, federal and tribal rights-of-way: Facilitate coordination and development of recommendations for legislation and Executive directives to enable one-stop-shopping, consistent fees, and expedited right-of-way permitting processes for last mile and middle mile inter-city/town transport.

Monitor legislative actions to ensure that explicit or de facto barriers to municipal participation in Broadband deployment are eliminated: Municipalities must be allowed to pursue broadband network solutions, and private sector firms must not be foreclosed from choosing to invest in and partner with municipalities. A framework of open processes and reasonable competitive neutrality allows all stakeholders to be heard. Reasonable examples are already being demonstrated in the marketplace voluntarily and without statutory mandates. It is believe that such a framework can encourage public-private partnerships and advance the goal of making affordable, high quality broadband available to all Arizonans.